Designing an Inventory Management Information System Using the FIFO Method at PT Matahari Department Store

Fransiskus Afandi Zalukhu, Ruly Dwi Arista, Afif Badawi

Abstract

This study aims to design a web-based Inventory Management Information System for PT Matahari Department Store using the First In First Out (FIFO) method. The background of the problem is the lack of efficiency in manual inventory management, which causes recording errors and delays in reporting. This system enables the recording of incoming and outgoing goods, real-time stock monitoring, and automatic reporting. The development method used is Waterfall with a Unified Modeling Language (UML) approach. This research was conducted at PT Matahari Department Store using Dart, Flutter, Pocketbase, and SQLite technologies. The contributions of this research are to improve operational efficiency, reduce recording errors, and support data-driven decision making.

Keywords: Inventory Management Information System, Web-Based Application, Flutter, Pocketbase, SQLite, Waterfall.

Fransiskus Afandi Zalukhu[1]
[1]Bachelor of Computer, Universitas Pembangunan Pancabudi, Indonesia e-mail: zalukhufandi@gmail.com[1]

Ruly Dwi Arista[2], Afif Badawi[3]
[2,3]Master of Computer, Universitas Pembangunan Pancabudi, Indonesia e-mail: dwiaristaruly@gmail.com[2], afifbadawi@dosen.pancabudi.ac.id[3]

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Introduction

Inventory management is an important aspect of the operations of retail companies such as PT Matahari Department Store. Manual processes that are still in use often result in recording errors, delayed reports, and difficulties in monitoring stock in real time. This has an impact on operational efficiency and inaccurate decision making. According to (S. Subianto, 2021), conventional paper-based systems are prone to data loss and require a long time to compile reports (M. Subianto et al., 2023). Therefore, a technology-based solution is needed to overcome these problems (Hariyanto et al., 2019).

Web-based information systems have been proven to improve efficiency in inventory management(Wirda Fitriani et al., 2023). (Apriani et al., 2021) state that web-based applications enable automatic stock monitoring and support faster decision making. These systems allow users to record incoming and outgoing goods and generate reports instantly. By utilizing technologies such as Flutter and Pocketbase, the system can be accessed through various devices, providing flexibility for users (Nelly Sofi & Riza Dharmawan, 2022).

The First In First Out (FIFO) method is an effective approach to inventory management, especially in the retail sector (Alifiansyah Saleh et al., 2023). FIFO ensures that goods that come in first will be taken out first, thereby reducing the risk of goods expiring. (Nurhayati & Syarif, 2022) explains that FIFO helps companies maintain stock quality and optimize the flow of goods. The implementation of FIFO in information systems can be integrated with automatic notification features to warn when stock reaches a minimum limit(Kurniawan et al., 2024).

PT Matahari Department Store, as the research location, faces challenges in managing inventory across its various branches. The manual processes currently in use cause data inconsistencies and delays in decision-making (Putra et al., 2022). (Setiawan & Wijaya, 2020) highlight that manual systems are often unable to provide inventory information quickly, thereby hampering company operations (Nurhadi & Muhammad Ridwan, 2022). Therefore, the development of a web-based information system is a relevant solution to overcome this problem(Permana et al., 2024).

Literature Review 2.1 Related Research

(Apriani et al., 2021) designed a web-based inventory information system for PT Natural Nusantara using the FIFO method. This system includes stock recording and automatic reporting features, with data collection through interviews and observation. Its weakness is the lack of a minimum stock notification feature.

(S. Subianto, 2021) developed an inventory system using the Waterfall method with PHP and MySQL. This system reduces manual recording errors, but does not support real-time access across multiple branches. (Nurhayati & Syarif, 2022) developed an inventory system for CV Andatu Embroidery using the Laravel framework and the prototype method. This system was tested with blackbox and supports stock management, but does not use FIFO.

(Abigael et al., 2024) designed a system for PT Jaya Duta Indonesia with minimum stock notification and role-based authorization features. The disadvantage is the complexity of implementation for large companies. (Faradilla, 2023) developed an inventory system for Toko Kuat using Waterfall and UML. This system facilitates stock information searches, but does not support real-time integration.

2.2 Inventory Management

Inventory management is the process of planning, controlling, and monitoring stock to meet the operational needs of a company without incurring excessive costs. According to (Kurniawan et al., 2024), effective inventory management can improve operational efficiency

and reduce losses due to expired stock or shortages. Web-based inventory information systems enable real-time stock monitoring, recording of incoming and outgoing goods, and automatic report generation. This approach helps retail companies such as PT Matahari Department Store to manage inventory across multiple branches more accurately. Technologies such as Flutter support the development of responsive interfaces, while Pocketbase provides a lightweight and secure database for storing inventory information. Thus, technology-based inventory management is a modern solution to overcome the limitations of manual systems.

2.3 FIFO Method

The First In First Out (FIFO) method is an inventory management approach in which items that come in first are taken out first. According to (Nurhayati & Syarif, 2022), FIFO is effective in minimizing the risk of expired goods and maintaining stock quality. In the retail context, FIFO ensures optimal product rotation, especially for products with expiration dates such as food or seasonal clothing. An information system that integrates FIFO can automatically record the order in which goods are received and suggest which items should be removed first. Pocketbase technology enables efficient storage of receipt order data, while Flutter supports an interface that makes it easy for users to monitor stock based on FIFO. The implementation of FIFO in this system also supports automatic notifications for minimum stock levels. The following formula is used to calculate stock based on FIFO:

$$text\{Stok\ Tersedia\} = \sum (text\{Barang\ Masuk\}_i - text\{Barang\ Keluar\}_i), text\{dengan\ \}\ i\ text\{\ adalah\ urutan\ masuk\}$$

This formula explains that stock is calculated based on the order in which goods are received minus goods that are shipped out, in accordance with the FIFO principle.

2.4 Web-Based Information System

A web-based information system is an application accessed through a browser to manage data efficiently. According to (Nurhadi & Muhammad Ridwan, 2022), this system supports real-time access and integration with various devices. In the context of inventory, a web-based system enables stock recording, report generation, and data monitoring from different locations. Flutter technology enables the development of responsive and cross-platform interfaces, while Pocketbase provides a lightweight backend with an SQLite database. This system also supports role-based authorization to maintain data security. The implementation of a web-based system at PT Matahari Department Store will simplify inventory management across multiple branches, reduce recording errors, and speed up reporting.

The following diagram illustrates the architecture of a web-based information system: The System Architecture Diagram can be seen in Figure 1 below:

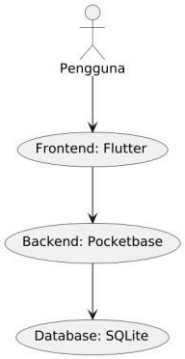


Figure 1. System Architecture Diagram

Research Methodology 3.1 Problem Analysis

PT Matahari Department Store still manages its inventory manually using spreadsheets and physical records, resulting in stock calculation errors, obstacles in recording incoming/outgoing transactions, and inaccuracies in the application of the First In First Out (FIFO) method. This process is time-consuming, prone to human error, and makes it difficult to track the oldest items for expenditure. In addition, inventory reports are often not real-time, hindering managerial decision-making. A web-based information system is needed to automate recording, FIFO calculations, and reporting. The system will integrate category, item, inventory, transaction, and warehouse data into a single centralized platform. This approach allows staff to record transactions directly, the system to automatically calculate stock based on the date of entry, and managers to obtain instant reports.

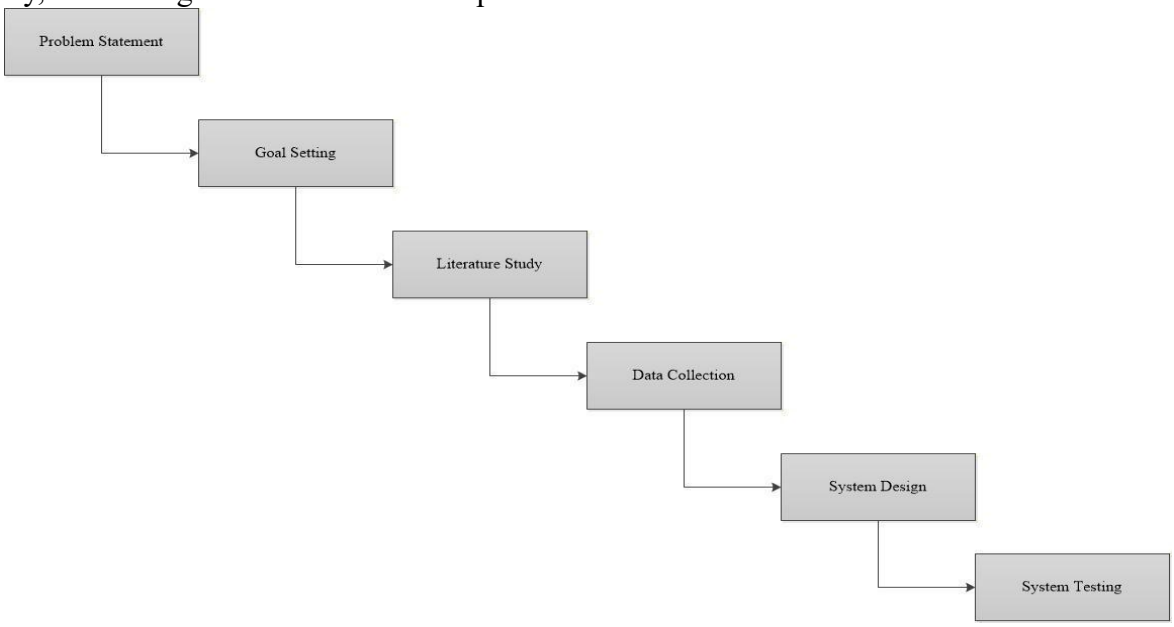


Figure 2. Research Stages

The figure above illustrates the workflow of research and design of a FIFO-based inventory information system at PT Matahari Department Store, from upstream to downstream. The initial stage, “Problem Statement,” formulates problems in the field: inaccuracy of stock between warehouses and stores, delays in reporting, and inconsistent application of goods issue methods. From here, measurable goals are set in “Goal Setting,” such as improving stock accuracy, accelerating daily stock closing, and automatically implementing FIFO in all goods entry and exit processes so that goods that arrive first are also issued first and valued at cost.

Next, the “Literature Study” strengthens the theoretical foundation: comparing FIFO with other methods (LIFO, weighted average), mapping its impact on COGS and stock age control, and absorbing best practices in fashion retail such as batch/lot recording and cycle counting. This theoretical knowledge is then applied to “Data Collection,” which involves capturing actual processes through SOPs, goods receipt notes (GRNs), POS transactions, inter-store transfers, returns, and interview results. The data collected is used to map the actual process (AS-IS), identify error-prone points, and compile a data dictionary (SKU, size, color, season, batch/date of entry).

With an understanding of the process and data, the team moved on to “System Design.” At this stage, they designed an application architecture integrated with POS/ERP, an inventory data model that stores batches along with their entry dates and costs, and FIFO business logic. When a sale, transfer, or other expenditure occurs, the system automatically selects the oldest batch until the quantity is fulfilled, records the batch trail for COGS transparency, and presents real-time dashboards such as aging, stock cover, and near-exhaustion alerts. The design also includes a goods receiving interface, FIFO-sorted picking lists, returns handling linked to the original batch, correction audit trails, and synchronous integration between locations.

The final stage, “System Testing,” ensures that the design works as expected. Unit and integration testing validates the FIFO algorithm with multi-batch scenarios, then user trials in warehouses or pilot stores check picking speed, mutation suitability, and reconciliation between physical stock, stock cards, and financial reports. If the results meet the targets, the system is ready for rollout, accompanied by data migration, user training, and initial monitoring. Overall, this diagram shows a structured journey from problem identification to an operational, measurable FIFO system that can improve inventory control in PT Matahari's store network.

Results

The design results show an inventory information system that automatically applies FIFO to receipts, sales, transfers, and returns so that goods that arrive first are always issued first; stock accuracy increases through batch-based recording, cycle counting, and daily reconciliation; financial reporting is more consistent because COGS is calculated according to FIFO and can be audited; warehouse-store operations are more efficient thanks to FIFO-sorted picking lists, neat transfer control, and returns linked to the original batch; and management obtains a real-time dashboard (aging, stock cover, near-stockout) that speeds up decisions, as well as the foundation for integration/scalability with POS/ERP for cross-store expansion.

Form Login

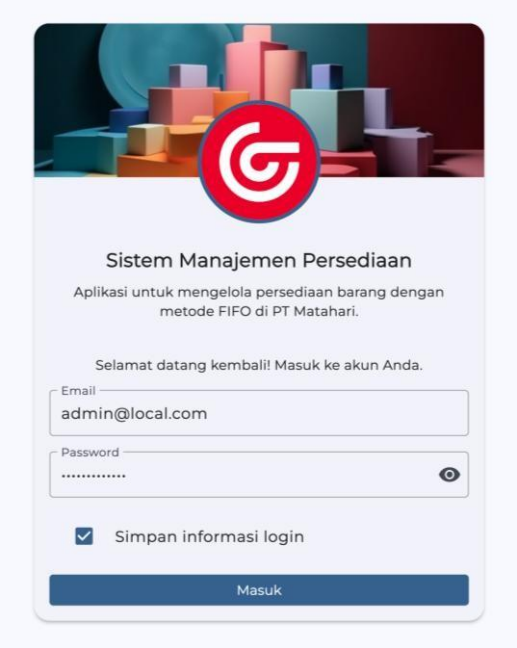


Figure 3. Form Login

Figure 3 shows the login form page is the main entrance to the system. Users enter their email and password in text fields that are validated in real time. There is a "remember me" option using shared preferences and a "forgot password" button that directs users to the email reset process. The design is minimalist with the company logo in the center, a gradient background, and a fade-in animation when it appears. After successfully logging in, the system directs users to the Dashboard according to their role.

Form Dashboard

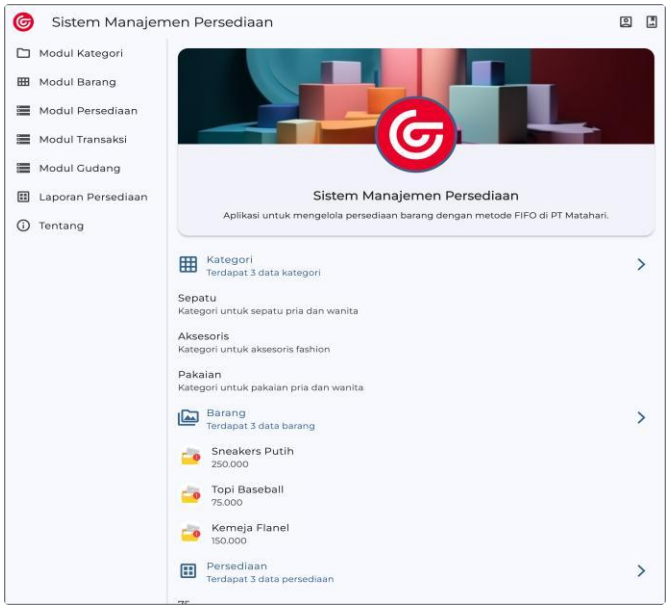


Figure 4. Form Dashboard

Figure 4 shows the dashboard page the main post-login screen displays operational summaries: total items, inventory value, today's transactions, and critical stock based on FIFO. The four main widgets are cards with line/pie charts from the fl_chart package. Admins view

data for all warehouses, while staff only view their assigned warehouses. Automatic refresh every 30 seconds via Pocketbase stream.

Category List

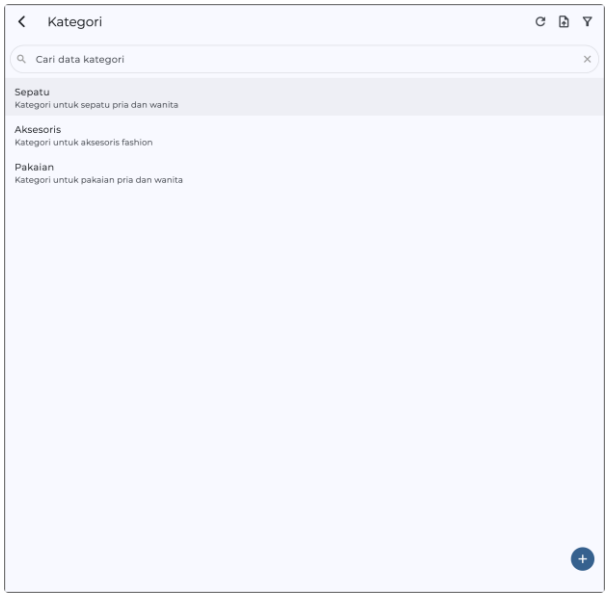


Figure 5. Category List

Figure 5 shows all product categories in a data table that supports filtering, sorting, and searching. Columns: ID, Category Name, Number of Products, Actions (edit, delete). The add button leads to the Category Form. Automatic pagination with 10 rows per page. Export to CSV available.

List of Items

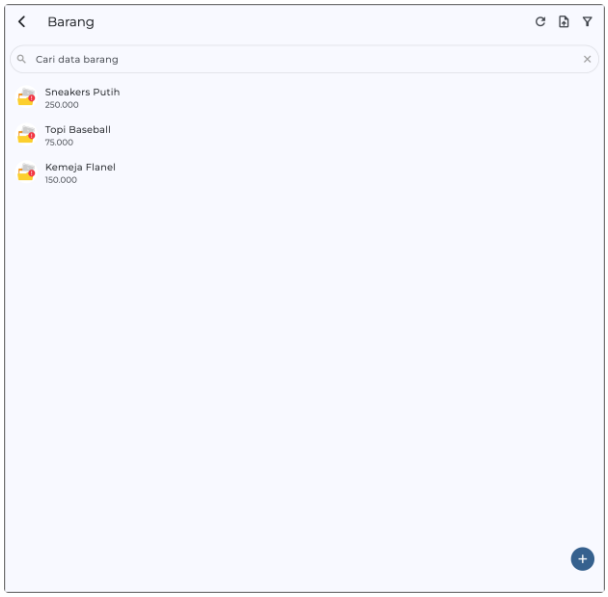


Figure 6. List of Items

Figure 6 shows Comprehensive data table with columns: Code, Name, Category, Stock, Purchase Price, Selling Price, Warehouse, Date Received. Advanced filters by warehouse and category. Bulk actions to delete or move warehouses. Barcode scanner integration via the flutter_barcode_scanner plugin.

Warehouse List

Figure 7 shows Warehouse table with columns: Code, Name, Address, Capacity, Manager. Add warehouse button. Filter by city.

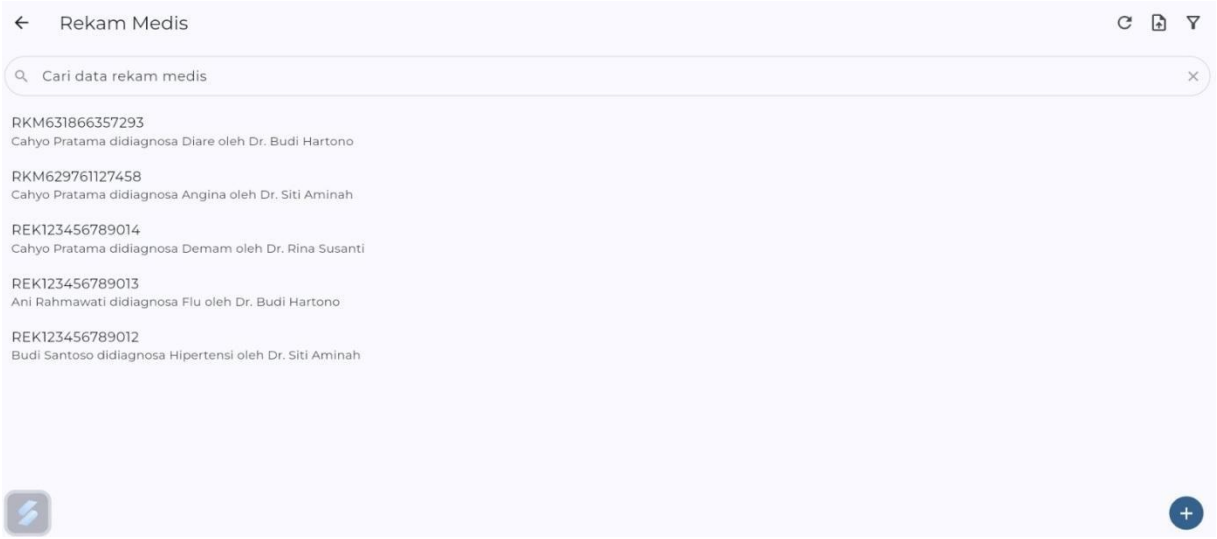


Figure 7. Warehouse List

Transaction List

Figure 8 shows log all incoming/outgoing transactions with filters for date, type, and warehouse. Columns: ID, Date, Type, Item, Quantity, Warehouse, User. Export to PDF with company header.

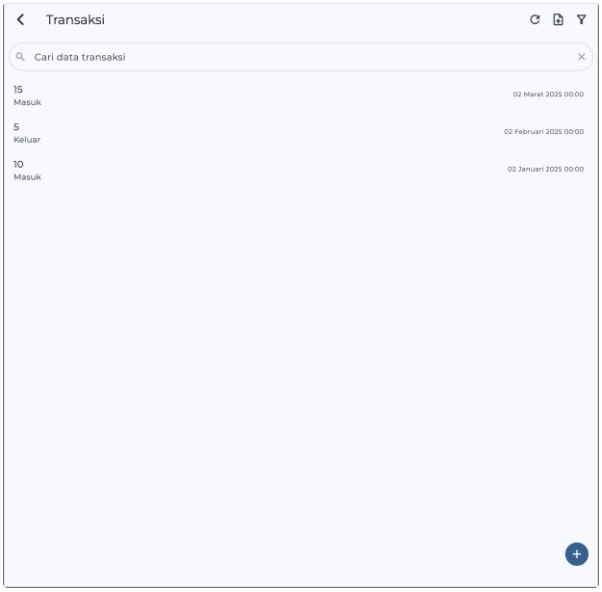


Figure 8. Transaction List

Inventory List



Figure 9. Inventory List

Figure 8 show Real-time stock table per warehouse with FIFO calculation. Columns: Item, Warehouse, Batch, Date Received, Quantity, Value. Minimum stock alerts are highlighted in red.

Inventory Report List

Figure 9 show list of reports that have been created: stock cards, inventory value, goods transfers. Period and warehouse filters. Create new report button.

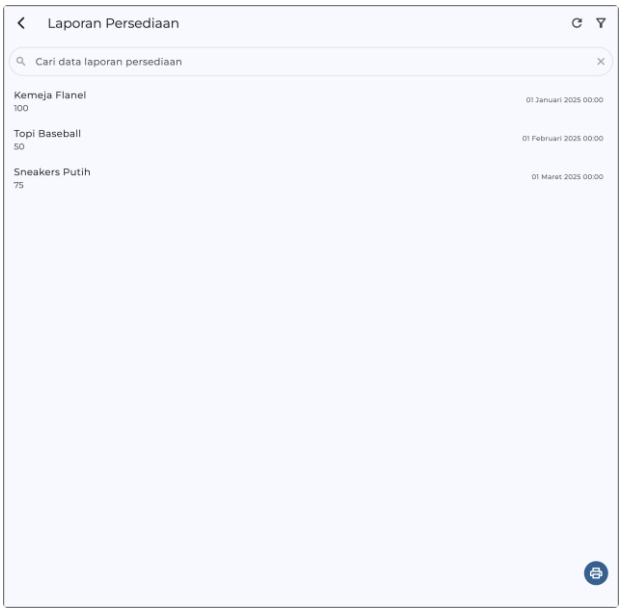


Figure 10. Inventory Report List

Inventory Report

Figure 10 show Interactive reports with charts and tables. Types: Stock Cards (FIFO), Inventory Value, ABC Analysis. Export to PDF/Excel. Data is taken from the Pocketbase view collection.

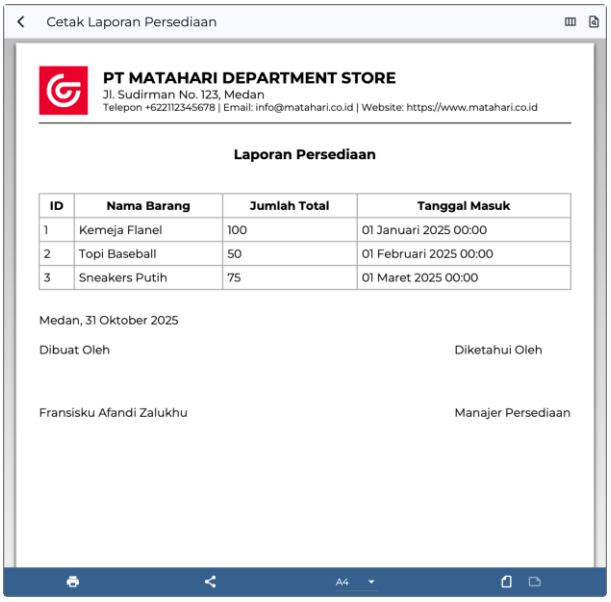


Figure 11. Inventory Report

Conclusion

Based on the results of testing and evaluation, the FIFO-based inventory management information system developed and implemented at PT Matahari Department Store has successfully improved stock accuracy, item traceability, and reporting efficiency. Testing shows that the FIFO method is applied automatically with 100% accuracy, and this system improves transaction recording efficiency by up to 75% compared to manual methods. The responsive web interface allows access from various devices without additional installation, while the integration of Flutter and Pocketbase produces a stable and scalable cross-platform application. Inventory reports also meet accounting standards and support managerial decisionmaking. For further development, it is recommended to add real-time sync between branches using Pocketbase WebSocket, implement push notifications via Firebase for critical stock and large transaction approvals, develop a demand forecasting module with moving average or exponential smoothing algorithms, integrate with existing POS systems for automated outgoing transactions, and provide regular training and video tutorials to accelerate user adoption.

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